What is the proper neon bulb for the HP3400A photochopper?

Date (https://groups.io/g/HP-Agilent-Keysight-equipment/topic/93914403?p=Created%2C%2C%2C20%2C2%2C0%2C0)

Mikek

Sep 25 (https://groups.io/g/HP-Agilent-Keysight-equipment/message/129837)

I have seen, NE-2, NE-2H, NE-2V and I think one other on this site, anyone know what will work best or what number the original was?
However after an hour of searching I have decided to ask.
Thanks, Mikek

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John kolb

Sep 26 (https://groups.io/g/HP-Agilent-Keysight-equipment/message/129850)

From the "A1H neon bulb for on/off press switch" topic in this group.
https://groups.io/g/HP-Agilent-Keysight-equipment/topic/76717919#109882 (https://groups.io/g/HP-Agilent-Keysight-equipment/topic/76717919#109882)

I believe the original neon's were NE-2U which is a CML A3C, I have attached the CML data sheet which is a little confusing if you don't place the two pages side by side and line up the tables.

The trick was a high intensity neon lamp that was "dark enhanced", normal neon lamps have difficulty striking in the dark, a minute amount of a radio active isotope was added to make them strike in the dark. The problem is this isotope has a half life of just over ten years so they all eventually die of old age, new stock is recommended.

Good luck

George G6HIG Dover UK

Newark can get them, minimum order 500
https://www.newark.com/wamco/wl-a3c/neon-lamp-t-1-3-4-wireleaded-red/dp/88T4251?ost=a3c+neon&cfm=true
(https://www.newark.com/wamco/wl-a3c/neon-lamp-t-1-3-4-wireleaded-red/dp/88T4251?ost=a3c+neon&cfm=true)
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John kolb

Sep 26 (https://groups.io/g/HP-Agilent-Keysight-equipment/message/129853)

People have replaced the Fluke 845AB photochopper neons withLED's. Needs new drive circuitry, of course. A NE555 timer at 330 Hz followed by a flip flop would do nicely.

John KK6IL
Show quoted text

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Chuck Harris

Sep 26 (https://groups.io/g/HP-Agilent-Keysight-equipment/message/129854)

An important thing to consider is what half-life means.

When a radioactive isotope reaches its half-life, it is
half way used up... by which I mean it is producing 1/2
of the radioactivity that it originally produced.

The reason it does this is because 1/2 of the original isotope has decayed to some other isotope... perhaps a non radioactive isotope.

So, for an isotope with a 10 year half life, after 20 years, it is producing 1/4 of the original activity.

After 40 years, 1/16th of the original activity.

Seems a small amount, but if the bulb was properly made, even 1/16th of the original activity should be drastically more than is necessary to allow the bulb to strike at a reasonable voltage in a totally dark condition.

The largest noticeable difference between a bulb that is new, and one that has lived many, many half-lives, is in how long it takes for a radioactive particle to excite some neon in the bulb to light.

This causes some "jitter" in DC activated lights, such as are used in choppers, and flicker in AC activated panel lamps.

In my experience, the radioactivity isn't the cause of a neon lamp to stop firing, but rather the cause is the loss of neon. The continuous bombardment of the electrodes in the lamp by neon ions, dislodges metal (which blackens the bulb), but it also buries neon ions in the metal... which dilutes the gas, raising the strike voltage.

-Chuck Harris

On Mon, 26 Sep 2022 04:36:56 -0700 "John kolb" <jlkolb@jlkolb.digitalspacemail17.net> wrote:

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On 9/25/2022 1:48 PM, Mikek wrote:

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> Thanks, Mikek

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Harvey White Sep 26 (https://groups.io/g/HP-Agilent-Keysight-equipment/message/129855)

If you can resurrect a rubidium standard lamp (under similar circumstances) by baking it gently, could baking the neon lamp do much the same?

Harvey

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Ed Breya

Sep 26 (https://groups.io/g/HP-Agilent-Keysight-equipment/message/129859)

I vaguely recall that the proper Ne lamp for these is NE-2U (modern version A3C?), as someone mentioned earlier. I think you can see a big difference in the operating current specs - much higher and brighter than typical Ne indicator lamps. I think these are the same type used in the old Fluke gear too, for their optical choppers.

I fixed a Fluke 845A null meter a few years ago, by replacing the Ne lamps with bright "white" LEDs. It turned out that I didn't even have to make a new driver, and just added some series resistance to get about the same current the Ne ones took (around 100-300 uA as I recall). The LEDs are so much more efficient that the chopper didn't work right. The light is coupled through two adjacent clear plastic rods, to the board with the CdS cells, and they were so bright that there was enough cross-talk to spoil it. I added sleeving around the rods to block the light leakage, and it worked great.

This kind of scheme only works in a "driven" Ne system, where a definite circuit generates the desired waveforms, and forces the lamps on and off. In a system that depends on the Ne lamp characteristics to form an oscillator, or if they have a significant effect on circuit operation, it's a different story.

Ed

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Matt Huszagh

Sep 26 (https://groups.io/g/HP-Agilent-Keysight-equipment/message/129860)

"Mikek" <amdx@knology.net> writes:

> I have seen, NE-2, NE-2H, NE-2V and I think one other on this site, anyone know what will work best or what number the original was? However after an hour of searching I have decided to ask.

Not a direct answer, but Paul Carlson has a video where he recreates the chopper circuit for an HP 419A and tests a bunch of neon bulbs for the purpose:

https://www.youtube.com/watch?v=vrmwql2msbU (https://www.youtube.com/watch?v=vrmwql2msbU)

Might be useful.

Matt

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Ed Breya

Sep 26 (https://groups.io/g/HP-Agilent-Keysight-equipment/message/129861)

I also found that the HP741A chopper sections use the same Ne lamps, and they are driven, so I had planned to do the same LED trick, since it has some flakiness in operation. However, I checked the chopper CdS cells according to the method described in the manual, and they seem to be OK. I also opened the choppers, and it appears that the Ne lamps are OK too - nice and bright and steady. So for now, it will remain stock. I may have to find something else to blame for the problem, but if it ends up being the lamps, then the LEDs will go in.

Ed

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Mikek

Sep 26 (https://groups.io/g/HP-Agilent-Keysight-equipment/message/129862)

Here is a very short video showing the brightness of the two neons, They are plenty bright, but you will notice the one on the left does not have light length as long as the the one one the right. I am have trouble with the left side, but a dim neon would cause high LDR resistance not low. So, my thinking is I have defective LDRs.
https://www.dropbox.com/s/ktrk8p3ikdt69yr/HP3400A%20Neon%20Bulb%20intensity%20video.mp4?dl=0
(https://www.dropbox.com/s/ktrk8p3ikdt69yr/HP3400A%20Neon%20Bulb%20intensity%20video.mp4?dl=0)
Mikek

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Ed Breya

Sep 26 (https://groups.io/g/HP-Agilent-Keysight-equipment/message/129863)

I just took a quick look at a CML Ne datasheet. The NE-2U and NE-2H variants seem to be the right ones. These are called "high brightness," for operating around 1.9 mA. which is about three times that of the "standard brightness" ones used for indicators, such as NE-2, NE-2T, NE-2V, and NE-2E.

Ed

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Ed Breya

Sep 26 (https://groups.io/g/HP-Agilent-Keysight-equipment/message/129864)

Of course, this is only from a maximum optical power perspective. The maximum available power, lamp type, and operating current may be different depending on the actual chopper construction and CdS cells used. Maybe any Ne lamp will work fine in some, while others may require specific types.

Ed

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Dave Wise

Sep 26 (https://groups.io/g/HP-Agilent-Keysight-equipment/message/129865)

A couple of my sixteen 740B cells are blind, but the rest are quite sensitive. They are scattered over a couple orders of magnitude. Over-illuminating a cell slows it down, which simultaneously hurts gain and input loading. After scoping curve families of R vs T at various light levels, I gave up on neon. I'm using LEDs, with drive current adjusted per cell to get consistent R-lit. I use H11F1's for demodulation, and discard the slow cells, keeping the fast ones in the modulator. I will have gain to spare, along with high Rin. In the 3400A, the -17.5V supply could drive 9V surface-mount white LEDs in the 2835 size.

Dave Wise
Last I checked, my 3400A was working okay with its original chopper. Ditto the Fluke 895A. I ought to measure the cells.
Show quoted text

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Mikek

Sep 26 (https://groups.io/g/HP-Agilent-Keysight-equipment/message/129866)

On Mon, Sep 26, 2022 at 01:48 PM, Dave Wise wrote:

> I use H11F1's for demodulation, and discard the slow cells, keeping the fast ones in the modulator.

Out of four LDRs, I suspect 3 of them are poor candidates for reuse.
Can you tell me what you use to drive the H11F1? A 555?
Why not replace the modulator with H11F1s?
Do you have a schematic I could work from?
It seems as simple a 555 driving the input to the H11F1s and the switches in place of the LDRs, But, I'd like to get it right the first time I build it.
Thanks, Mikek
PS. my unit has the 03400-66508 Version A

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Dave Wise

Sep 26 (https://groups.io/g/HP-Agilent-Keysight-equipment/message/129867)

On what basis do you suspect your three of four LDRs? I've come around to believe the only sure figure of merit is the time it takes the cell to relax to high resistance after being lit up. Since the relaxation rate varies with light level, you have to pick a target R-lit; I have used 20K, and measure the time to relax to 100K.

The 3400A drives the cells with no dark time. Dark time is beneficial for R-in, but since the 3400A is driving the modulator with a (low-impedance) thermocouple, R-in doesn't matter.
The 3400A operates at millivolt levels, not the 740B's microvolt levels, so the offset and drift problems I encountered will be "down in the noise" in a 3400A. So sure, you can use all H11F1's if you want.

I'm using a microcontroller, with a program I wrote. But since all you need is a single square wave, sure, a 555 will do fine. Tune it for 95Hz and drive the series H11F1's from plus and the shunts from minus. Drive them at 10-15mA.

Dave Wise
Show quoted text

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Glenn Little

Sep 26 (https://groups.io/g/HP-Agilent-Keysight-equipment/message/129870)

Unless the way the opto-isolators are made they will change in their sensitivity due to changes in the optical medium within the case.
I worked for a company that used a lot of opto-isolators and they were the highest failure rate part that we used.
The gain would decrease over time and would require changing to restore operation.
This change took place over a period of a few tears.
The opto-isolators were used within their design specs and were used to couple to a phone line.
YMMV, but, this was my experience.
The opto-isolators will work and will probably outlive the neons and LDRs, but, are not a forever solution.

Glenn

On 9/26/2022 6:07 PM, Dave Wise wrote:

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Dave Wise

From: HP-Agilent-Keysight-equipment@groups.io (mailto:HP-Agilent-Keysight-equipment@groups.io) <HP-Agilent-Keysight-equipment@groups.io> (mailto:HP-Agilent-Keysight-equipment@groups.io) on behalf of Mikek <amdx@knology.net> (mailto:amdx@knology.net)
Sent: Monday, September 26, 2022 2:39 PM
To: HP-Agilent-Keysight-equipment@groups.io (mailto:HP-Agilent-Keysight-equipment@groups.io) <HP-Agilent-Keysight-equipment@groups.io> (mailto:HP-Agilent-Keysight-equipment@groups.io)
Subject: Re: [HP-Agilent-Keysight-equipment] What is the proper neon bulb for the HP3400A photochopper?

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PS. my unit has the 03400-66508 Version A

--

Glenn Little ARRL Technical Specialist QCWA LM 28417
Amateur Callsign: WB4UIV wb4uiv@arrl.net (mailto:wb4uiv@arrl.net) AMSAT LM 2178
QTH: Goose Creek, SC USA (EM92xx) USSVI, FRA, NRA-LM ARRL TAPR
"It is not the class of license that the Amateur holds but the class
of the Amateur that holds the license"

Dave Wise

Sep 26 (https://groups.io/g/HP-Agilent-Keysight-equipment/message/129872)

Thanks for your info, Glenn. Was your experience specific to the H11F series (PhotoFET output), or some other type?

I'm operating them as switches, driving at spec current to get maximum triode-mode passthru. I might eventually see a drop in system slew rate. I only use the 740B intermittently, so it will take years to rack up a few thousand hours. I should build a jig to run an H11F1 continuously. I could just hook it to a wall wart and check it again X months later.

Dave Wise

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John kolb

Sep 26 (https://groups.io/g/HP-Agilent-Keysight-equipment/message/129873)

Choppers are usually run at frequencies unrelated to the power line freq. The 3400 is run at 165 Hz, halfway between the 3rd harmonic of 59 and 60 Hz to be used anywhere.

John KK6IL

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Mikek

Sep 26 (https://groups.io/g/HP-Agilent-Keysight-equipment/message/129874)

On Mon, Sep 26, 2022 at 04:50 PM, Glenn Little wrote:

> On what basis do you suspect your three of four LDRs?

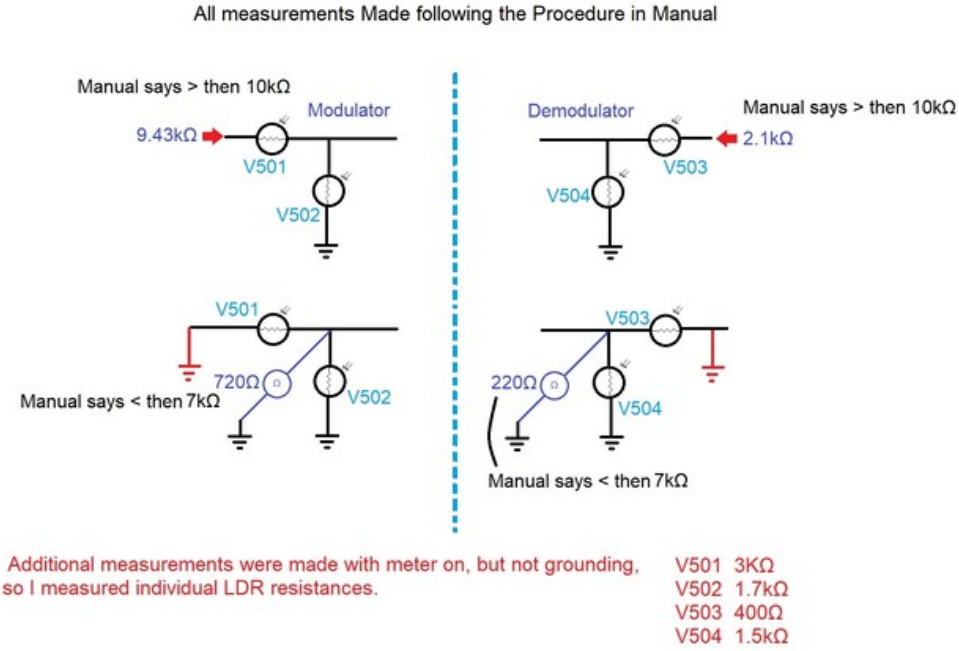
I base it on following the manual and going by the results I got from those measurements.
I show the results in the picture below, I also added my own measurements of the individual
LDRs at the bottom, these were made with the machine on, and neon bulbs pulsing.
The series and parallel ohms don't agree with the individual numbers, but, I'm thinking that is because
they are alternately on during the tests (series and parallel) provided by the manual.

>> Tune it for 95Hz and drive the series H11F1's from plus and the shunts from minus.<<
Ok, now that I'm starting to think this through. I need two on and two off, so I let the 555 supply current to the anode of the LEDs and have the cathode grounded,
then on the other two, I tie the anode to B+ and let the 555 sink current from the cathode.
Is that what you meant by shunt?

You say, "The 3400A drives the cells with no dark time."
I thought they would go dark every cycle. I think the voltage drops low enough to extinguish the neon.
This info from a neon bulb manufacturer,
Maintaining Voltage: The voltage across the lamp after it has ignited. This voltage is a function of the lamp current and is usually quoted at the design current. Nominal values are 80V for standard brightness and 75V for high brightness lamps.

Extinction Voltage: The voltage at which the lamp extinguishes if the supply voltage is reduced. It is normally a few Volts below maintaining voltage

Thanks, for your help and input, Mikek



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Dave Wise

Sep 26 (https://groups.io/g/HP-Agilent-Keysight-equipment/message/129875)

Dark Time is the time when BOTH neons are dark. The simple driver circuit in the 3400A always has one lamp lit and the other dark. When R-in is important, you have to have spaces where both lamps are dark, to give the just-turned-off photocell time to relax back to high resistance before you light up the other cell. The 740B and 419A both implement dark time, although they do it different ways.

Without trying to analyze it too much, I believed in HP's photocell checking procedure. But then I found that one of my 740B chopper modules checked out using their procedure but worked poorly in actual service. Now I scope the cells to watch them relax. I discovered

1. Some cells are sensitive, some are blind
2. R vs T is close to a straight line, so many ohms per second
3. R vs T can be fast on one cell, slow on another
4. R vs T slows down the harder you turn on the cell

Number 4 above is why I was going on about not overdriving the cell.
Because of number 3, I measured all my cells and kept the fast ones.
Number 1 is why I drive my cells with custom-tuned LEDs.

HTH,
Dave Wise

Show quoted text

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Mikek

Sep 26 (https://groups.io/g/HP-Agilent-Keysight-equipment/message/129877)

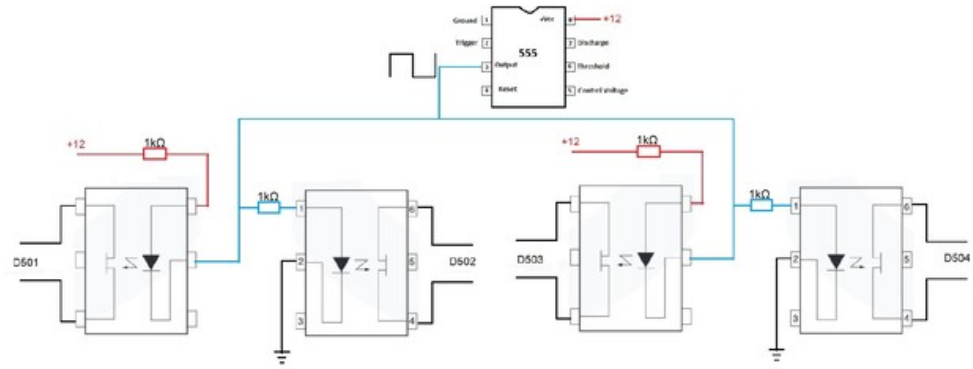
On Mon, Sep 26, 2022 at 07:22 PM, Dave Wise wrote:

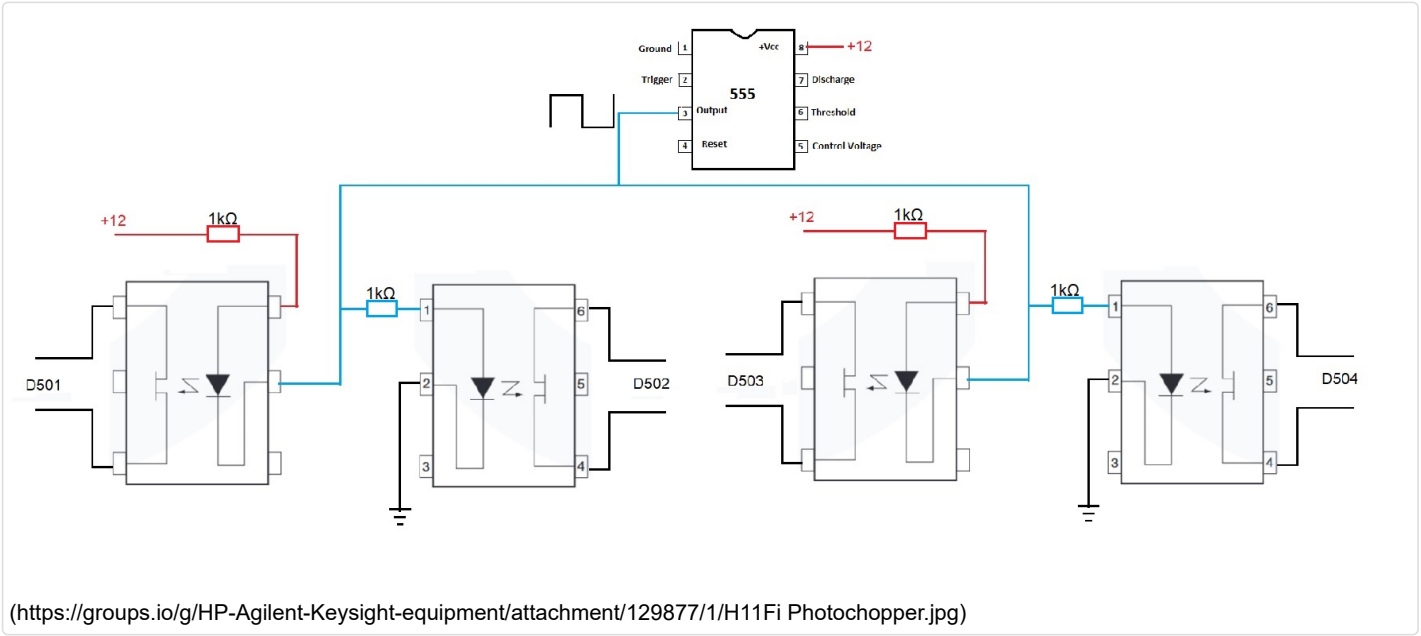
> But then I found that one of my 740B chopper modules checked out using their procedure but worked poorly in actual service.

In my case, they don't check out using their procedures, do you agree with my analysis, that I probably have 3 LDRs out of spec?

I understand what you said about dark time.
Thanks, Mikek

Here's a schematic of they way I think this should be wired, do I have it right?
I'll attach it just in case this is hard to read.





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